

Chemical Microsensor Instrument for UAV Airborne Atmospheric Measurements, Phase II

Completed Technology Project (2015 - 2017)



Project Introduction

The rapid expansion of available UAV types and increased mission capability (payload, flight duration, and system cost reductions) offers wide range of potential applications. The Airborne Chemical Microsensor System (AMS) instrument package being developed adapts low cost and low power chemical microsensor technology which has been demonstrated for fire detection and exhaust emission monitoring to airborne measurements. The fast time response and miniaturized system will provide a lightweight, low cost instrument for package for a wide range of deployments including aerostats (balloons and kites) to UAV such as Dragon Eye and SIERRA. Chemical species mapping using UAVs enables model validation and attaining new data that complements and augments traditional aerial and satellite data. However, there currently are limited options adapting commercial chemical sensors for detecting all species of interest at the levels required, and with fast response time. Wet electrochemical cells, which provide accurate measurement for some species, are typically slow (30-60 sec), sensitive to pressure changes, and are a potential hazard from leakage. Most commercial environmental carbon dioxide monitors are based on NDIR, with response time in the order of minutes. Hydrocarbons are monitored by generic combustible gas sensors. Instruments need to be low cost, compact and robust enough for incorporation in UAV systems, capable of surviving hard landings and sufficiently low cost that damage to the instrument and or loss of the UAV is not a major setback for the mission. The proposed solid-state, microsensor technology is well suited for this application, because of the low production cost and robust packaging. The proposed program provides a low cost instrument (less than \$1000 in limited quantities) for real-time carbon dioxide, sulfur dioxide, and methane detection.



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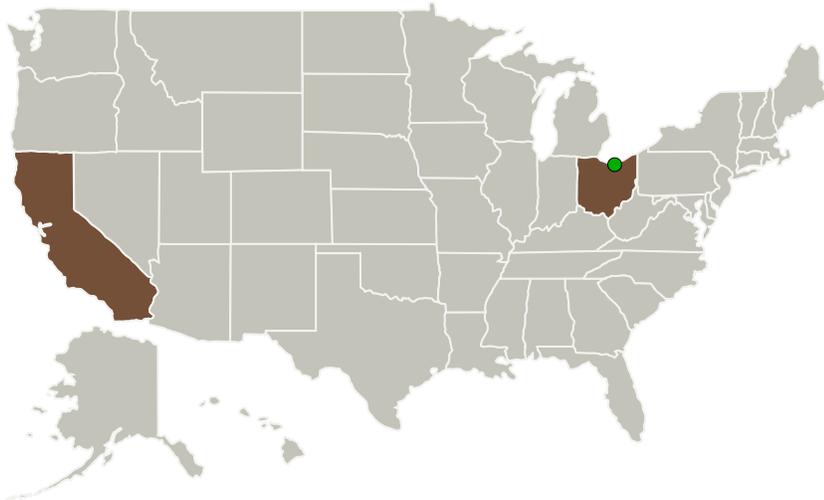
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Makel Engineering, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Chico, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Makel Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Darby B Makel

Co-Investigator:

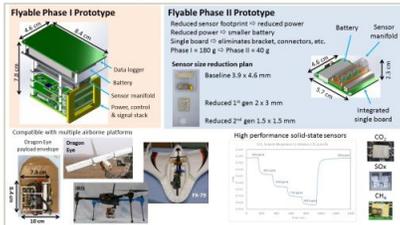
Darby Makel

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Images

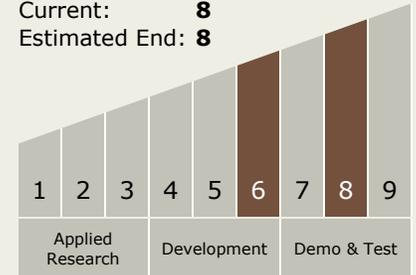


Briefing Chart

Chemical Microsensor Instrument for UAV Airborne Atmospheric Measurements Briefing Chart (<https://techport.nasa.gov/images/125846>)

Technology Maturity (TRL)

Start: 6
Current: 8
Estimated End: 8



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System